

10/14-6.84 EN



- Direct mass flow measurement
- Wide measuring range (1:40)
- High measuring accuracy  
measuring deviation < 1 % of measured value
- Quick response time ( $T_{63} = 12 \text{ ms}$ )
- No moving parts
- Low pressure loss
- Easy handling
- Immediately ready for operation
- Defined installation in pipe
- Exchangeable transducer
- Arbitrary mounting orientation
- Low weight
- Expansive accessories/measuring sections

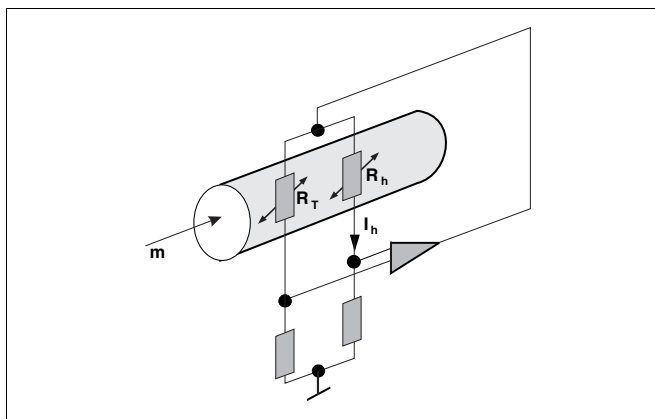
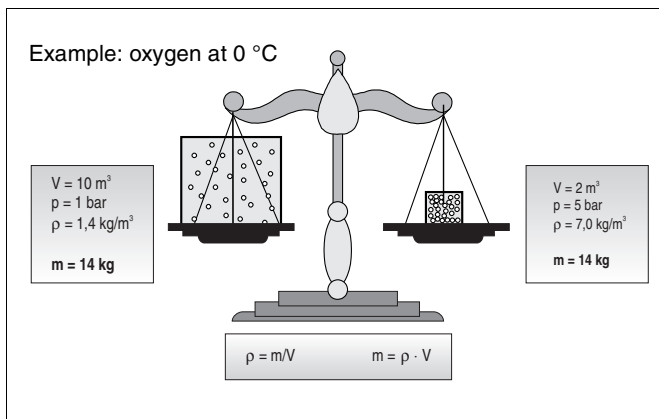
### Function and System Design

Sensyflow P operates according to the principle of a hot-film anemometer. This measuring method enables the gas mass flow rate to be determined directly, without the need for pressure and temperature compensation.

The Sensyflow P measuring system comprises of a transducer (measuring tube), a supply/evaluation unit and accessories. The transducer is designed as a measuring tube and incorporates the sensor unit and an electronic transmitter circuit. It is available in 6 nominal widths ranging from DN 25 to DN 200 and is installed by quick-clamping connectors in the measuring section.

The supply/evaluation unit is available as a 19" plug-in version or as a desktop unit. It provides the power supply for the transducer and converts its flow-dependent current signal into standard analog mass flow signals.

**Function and System Design**



Most conventional flow meters determine volumetric flow rates. To achieve a mass flow signal, a volumetric flow meter needs pressure and temperature compensation. These corrective actions make measurement more expensive and reduce the ultimate accuracy of the measuring system. Sensyflow measuring systems provide the mass flow rate directly, i.e. without further measurement or correction.

Example:

If 10 m<sup>3</sup> of oxygen is to be compressed from 1 to 5 bar at a constant temperature, the volume or volume flow will change to 2 m<sup>3</sup>, although the amount of substance and the mass are still the same (14 kg). In this case, a volumetric flow meter will only indicate 20 % of the original volume flow.

As a result, a volume flow measurement for gases without correction of pressure and temperature is meaningless.

The mass flow meter directly determines the mass per unit of time of a flowing medium; a measured value in kg/h is displayed. Parameters such as volumetric flow rate (referred to standard conditions) can be calculated directly from the standard density of the medium:

$$q_n = q_m / \rho_n \quad \text{e.g. in standard-m}^3/\text{h}^*) \quad \text{where}$$

$q_n$  = Volumetric flow rate referred to standard conditions (e.g. 0 °C and 1013 hPa)  
 $q_m$  = Mass flow rate  
 $\rho_n$  = Density referred to standard conditions (e.g. 0 °C and 1013 hPa)

\*) m<sup>3</sup>/h -q<sub>n</sub>

**Measuring principle**

Sensyflow operates according to the principle of the hot-film anemometer. This method of measurement is based on the abstraction of heat from a heated body by an enveloping gas flow. The flow-dependent cooling impact is used as the measuring effect.

The gas stream flows past two temperature-sensitive resistors R<sub>h</sub> and R<sub>T</sub> which are part of an electrical bridge circuit. Due to the chosen resistance ratio R<sub>h</sub> << R<sub>T</sub>, R<sub>h</sub> is heated by the current I<sub>h</sub>, and R<sub>T</sub> adopts the same temperature as the gas. The current I<sub>h</sub> is preset by the electronic control circuit to produce a constant temperature difference between the heated resistor R<sub>h</sub> and the temperature of the gas.

The electrical power generated with resistor R<sub>h</sub> exactly compensates its loss of heat to the gas flow. As this loss of heat is dependent on the number of particles which collide with the surface of resistor R<sub>h</sub>, I<sub>h</sub> represents the mass flow rate.

**Ordering information**

A measuring system consists of:

- Transducer, measuring pipe
- Power supply/evaluation unit
- Measuring section
- Cable for sensor

**Typical applications**

In a unique manner, Sensyflow P mass flow meters for air combine high accuracy, huge turn-down ratio and extremely fast response time. These features qualify them for the following application fields:

- Suction air measurements at combustion engines
- Test benches for turbo chargers
- Serial testing of flow dependent components like throttle valves, fans, air filters ...
- Quality assurance: reference unit for other flow meters
- Research & Development at universities and institutes

**Technical data**

**Measuring principle**

Hot-film anemometer

**Input**

**Measured medium**

Flow rate of air

**Measuring ranges (standard)**

Nominal size	kg/h
NW 25	0 ( 1)... 60
NW 50	0 ( 10)... 400
NW 80	0 ( 20)... 720
NW 100	0 ( 40)...1200
NW 150	0 ( 80)...2400
NW 200	0 (200)...4000

The value in brackets specifies the lower limit of the measuring range for which the given accuracy is achieved.

**Output**

**Output signals**

**Analog**

- 0... 10 V, (<4 mA)
- 0... 20 mA, (load < 500 Ω)
- 4... 20 mA, (load < 500 Ω)

**Digital**

serial V24/RS 232 C, electrically isolated  
ASAM-GDI interface

**Performance Characteristics**

Accuracy (including hysteresis and non-linearity)  
< ± 1 % of reading

Repeatability  
< ± 0,25 % of reading

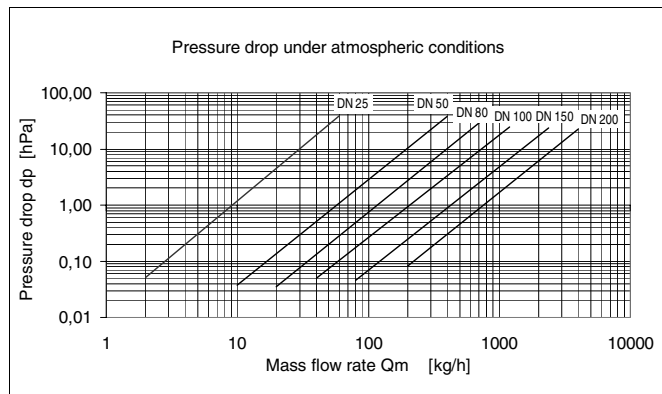
**Influences**

Temperature effect  
< 0,03 %/K of reading

Pressure effect  
≤ 0,2 %/100 kPa (/bar) of reading

Response time  
T<sub>63</sub> = 12 ms

Pressure loss transducer/measuring tube



**Operating conditions**

**Recommended steadying length**

- Inlet run  
10 × pipe diameter D (use of air filter strongly recommended)
- Outlet run  
5 × pipe diameter D

**Ambient conditions**

- Ambient temperature for transducer  
-25...80 °C
- Ambient temperature for evaluation unit  
-25...50 °C
- Storage temperature  
-25...85 °C
- Degree of protection  
Transducer: IP 54

**Process conditions**

- Operating temperature  
Medium -25...80 °C
- Operating pressure  
Standard : 0...2,5 × 10<sup>2</sup> kPa (2,5 bar abs.)  
Option: up to 8 × 10<sup>2</sup> kPa (8 bar abs.) only DN 25

**Mechanical Construction**

**Weight**

- Transducer/measuring tube  
depending on nominal size, see ordering information
- Evaluation unit  
19" plug-in version: 7,0 kg  
1/2 19" desktop housing 7,3 kg  
19" desktop housing 7,4 kg

**Material**

- Transducer: aluminium, black anodized
- Tubes: aluminium, black anodized or glass fibre, black coated

**Process connection**

Quick-clamping pipe flange, aluminium  
with quick-clamp chains / rings

**Electrical connection**

- Transducer: special connecting cable to evaluation unit

**Power supply**

Power supply/evaluation unit, voltage:  
230 V AC  
110 V AC

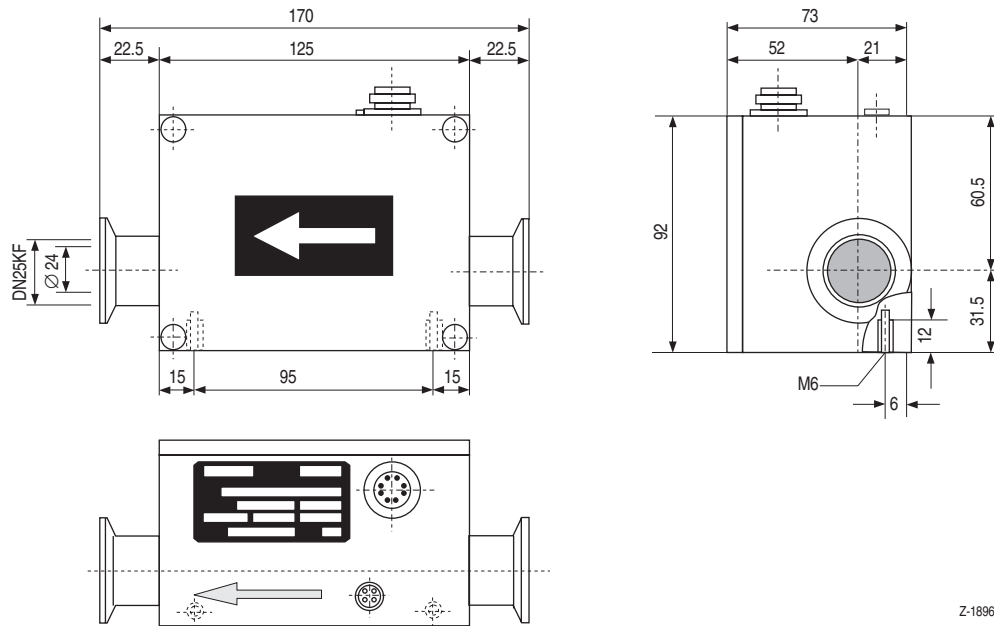
Power consumption  
evaluation unit: < 38 W

Power consumption  
transducer: < 10 W

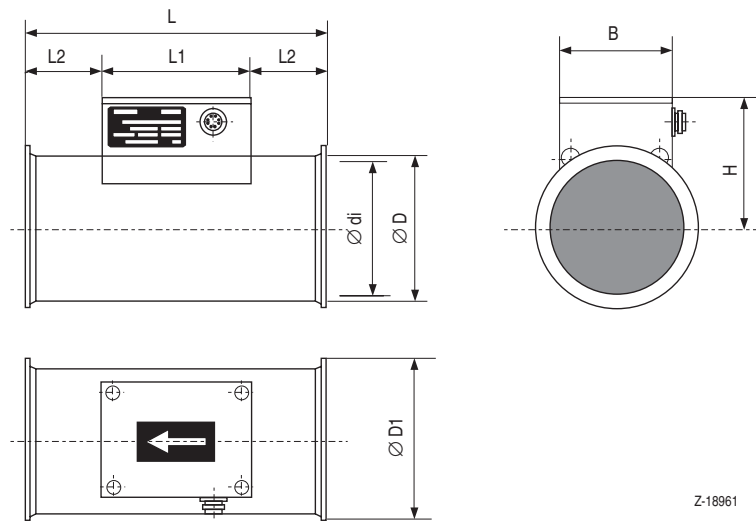
Current drain  
transducer: < 600 mA

**Dimensional drawing** (dimensions in mm)

**Sensyflow P DN 25**



**Sensyflow P DN 50...DN 200**

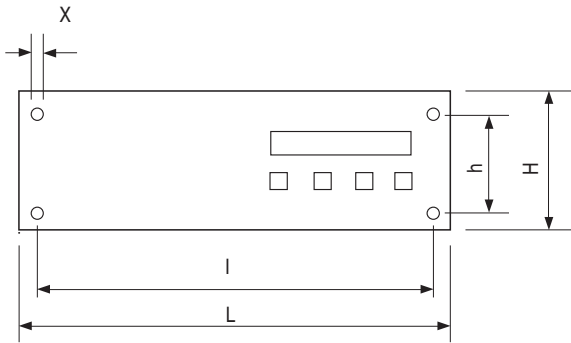


DN	Ø D	Ø D <sub>1</sub>	Ø di	L	L <sub>1</sub>	L <sub>2</sub>	B	H
50	64	80.0	58	180	125	27.5	92	85.0
80	89	108.5	80	185		30.0		93.5
100	118	132.5	109	250		62.5		108.0
150	165	180.0	153	280		77.5		131.5
200	220	240.0	200	330		102.5		159.0

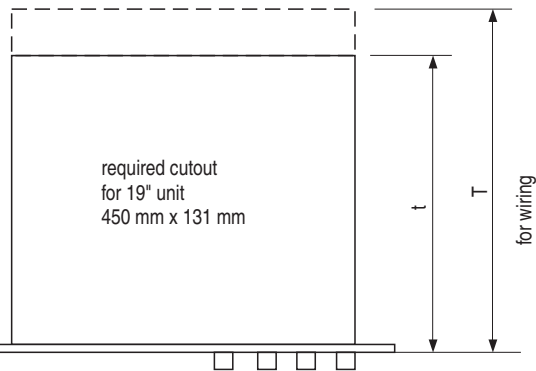
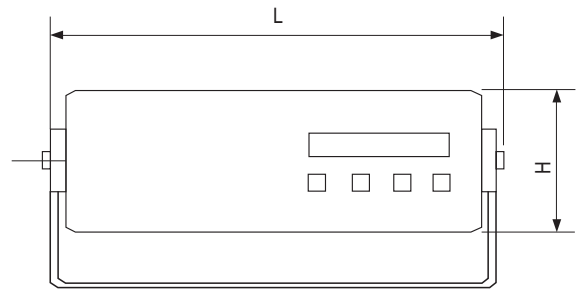
Dimensions in mm

**Dimensional drawing** (dimensions in mm)

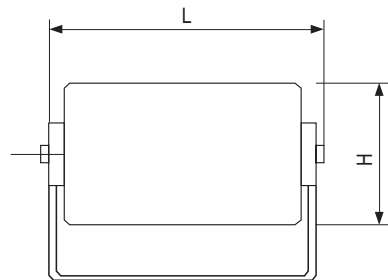
**19" Plug-in version**



**19" Portable unit**



**½" 19" Portable unit**



Z-17384

Unit	Dimension	L	l	H	h	T	t	X
½ 19" Portable unit		310	/	140	/	/	/	/
19" Portable unit		520	/	140	/	/	/	/
19" Plug-in version		483	462	132	58	425	325	M6

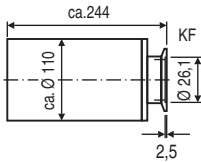
Dimensions in mm

**Dimensional drawing** (dimensions in mm)

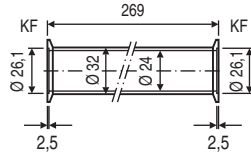
Modules NW 25

KF = Small flange

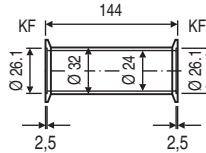
① Filter with flange



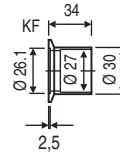
② 10 x D inlet tube with flanges (on both sides)



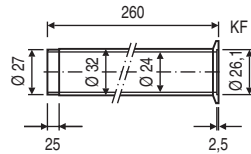
③ 5 x D outlet tube with flanges (on both sides)



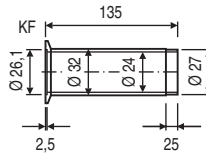
⑥ Hose adapter with flange (on one side)



④ 10 x D inlet tube with flange (on one side)



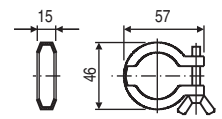
⑤ 5 x D outlet tube with flange (on one side)



⑫ O-ring



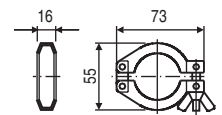
⑬ Clamping ring FL-special



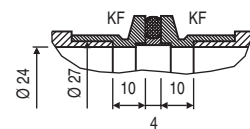
⑪ Inner-center ring



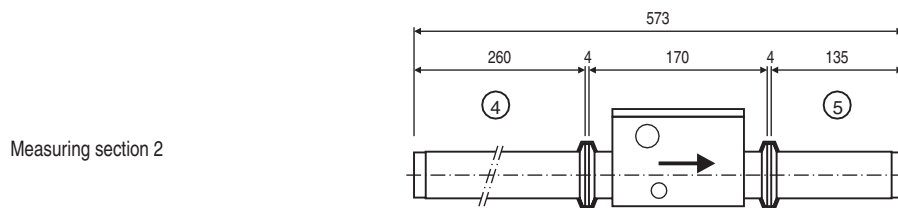
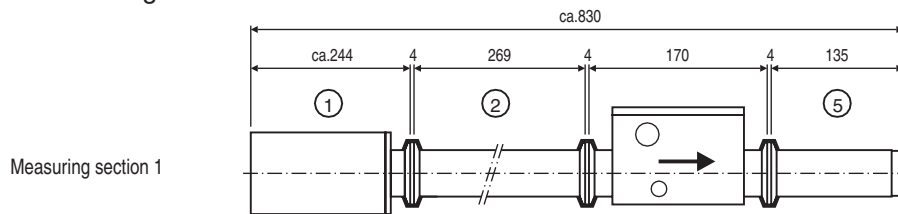
⑭ Clamping ring FL-Optimal AS



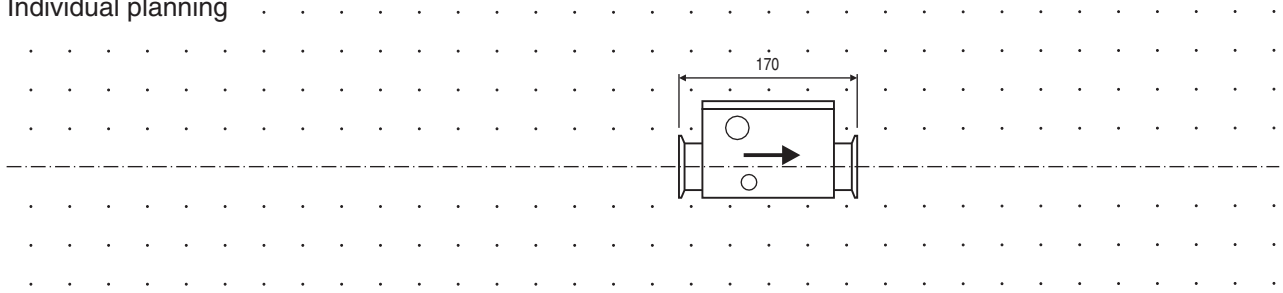
⑥ ⑪ ⑥ sectional detail pipe connection (without clamping ring)



Standard measuring sections



Individual planning

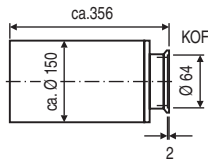


**Dimensional drawing** (dimensions in mm)

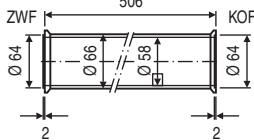
**Modules NW 50**

KOF = Tapered flange (with recessed face and groove for O-ring)  
ZWF = Intermediate flange (with raised face)

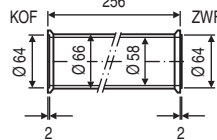
① Filter cartridge (open type) with flange



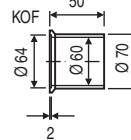
② 10 x D inlet tube with flanges (on both sides)



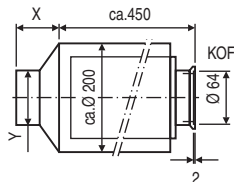
③ 5 x D outlet tube with flanges (on both sides)



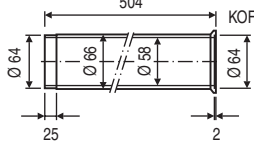
⑥ Hose adapter with flange (on one side)



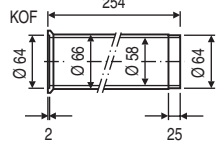
⑦ Filter unit (closed type) with flange



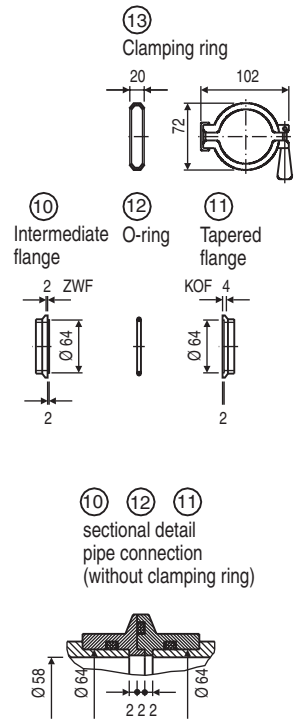
④ 10 x D inlet tube with flange (on one side)



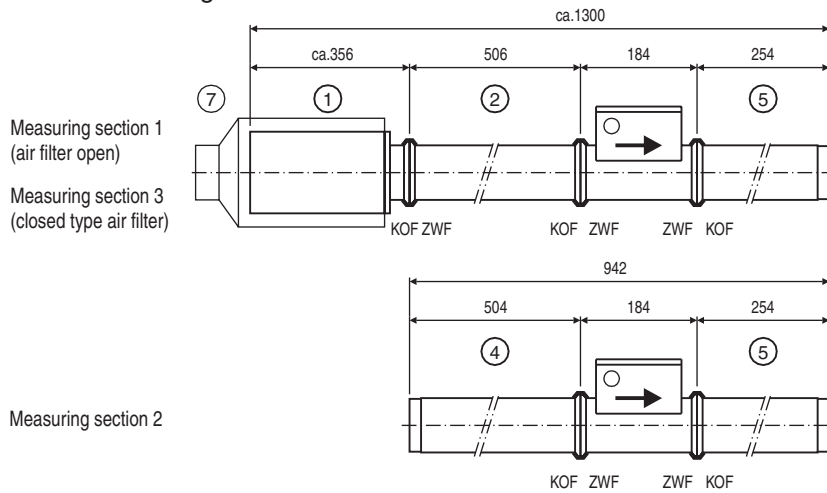
⑤ 5 x D outlet tube with flange (on one side)



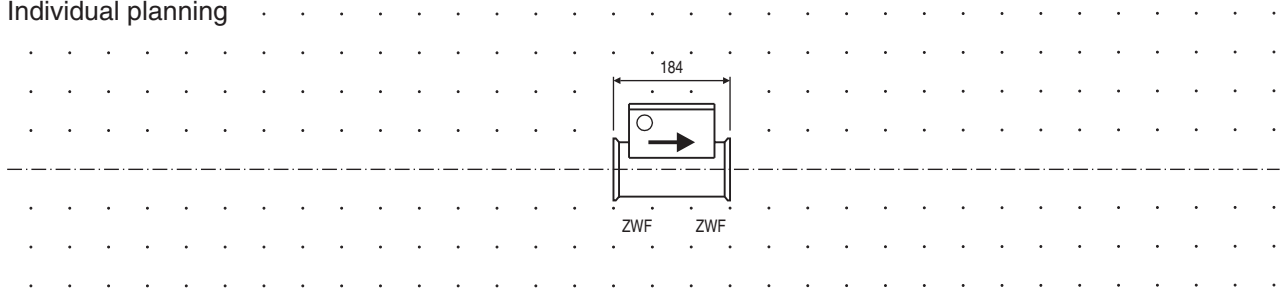
Dimensions X and Y depend on customer requirement



**Standard measuring sections**



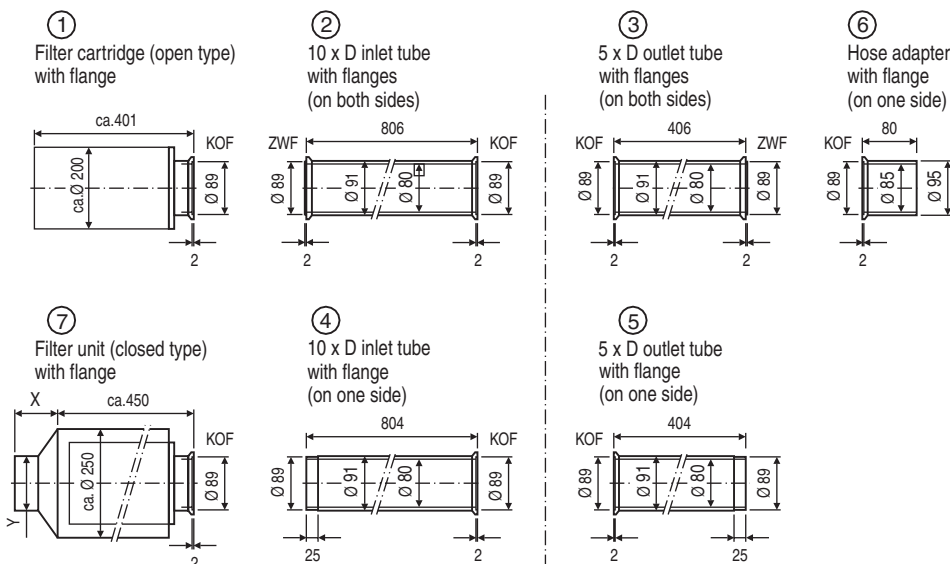
**Individual planning**



**Dimensional drawing** (dimensions in mm)

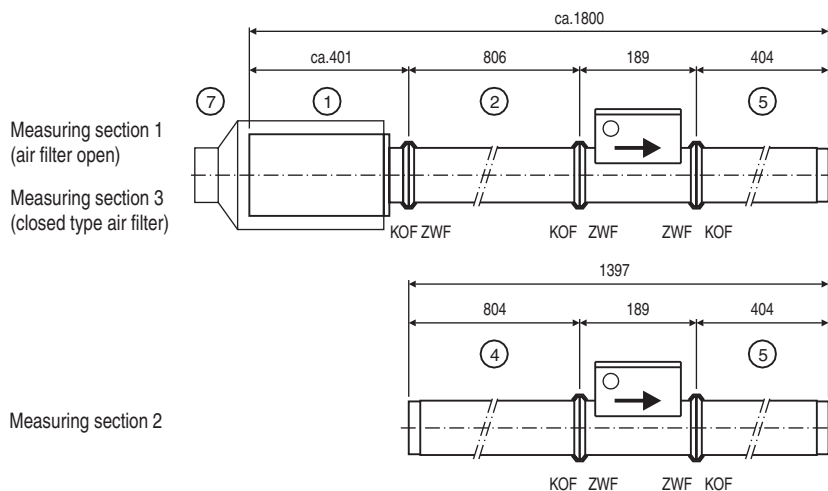
**Modules NW 80**

KOF = Tapered flange (with recessed face and groove for O-ring)  
ZWF = Intermediate flange (with raised face)

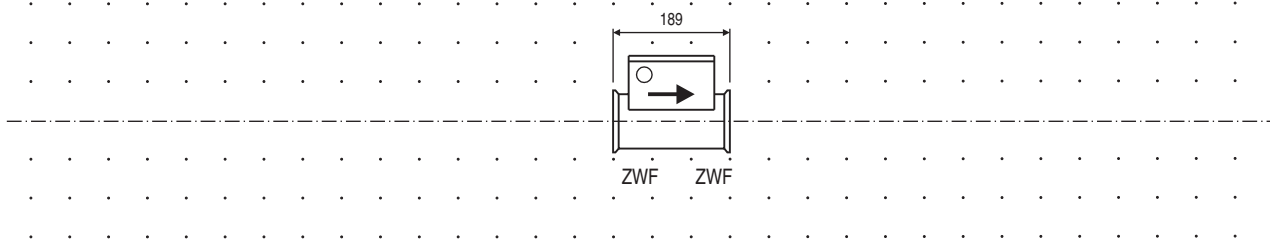


Dimensions X and Y depend on customer requirement

**Standard measuring sections**



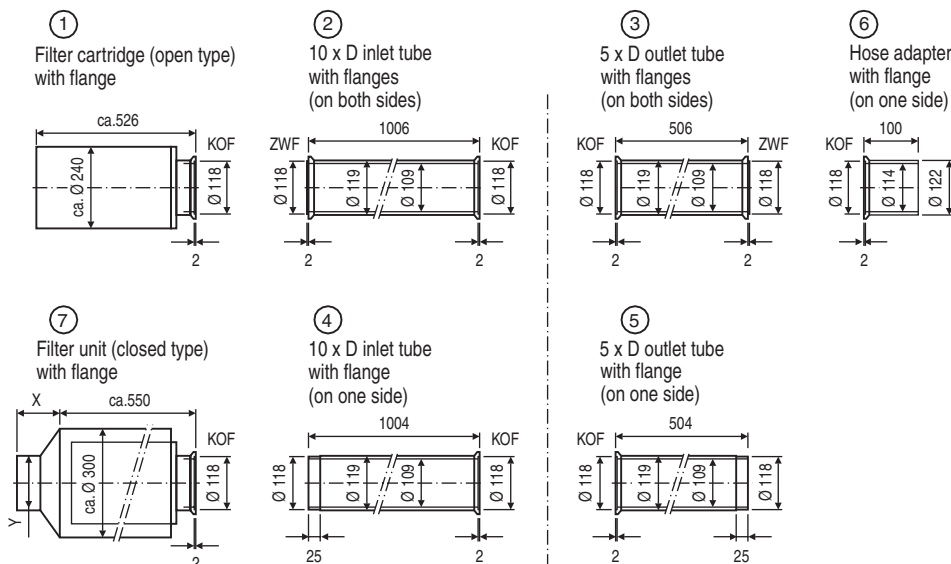
**Individual planning**



**Dimensional drawing** (dimensions in mm)

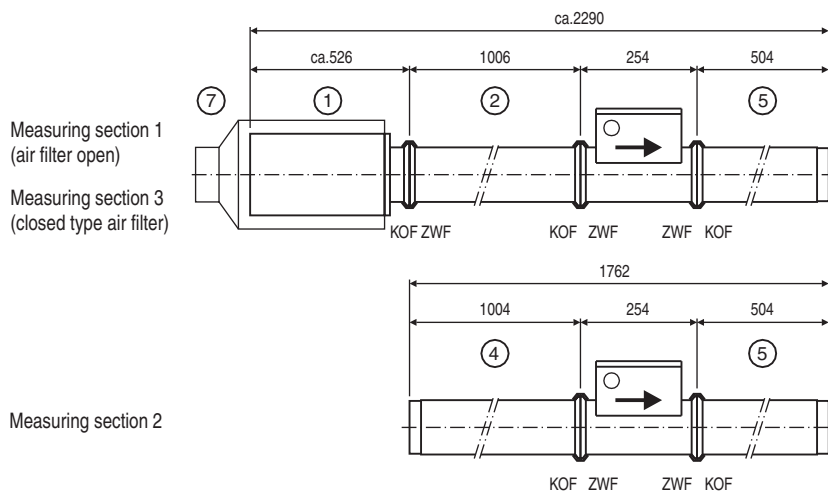
**Modules NW 100**

KOF = Tapered flange (with recessed face and groove for O-ring)  
ZWF = Intermediate flange (with raised face)

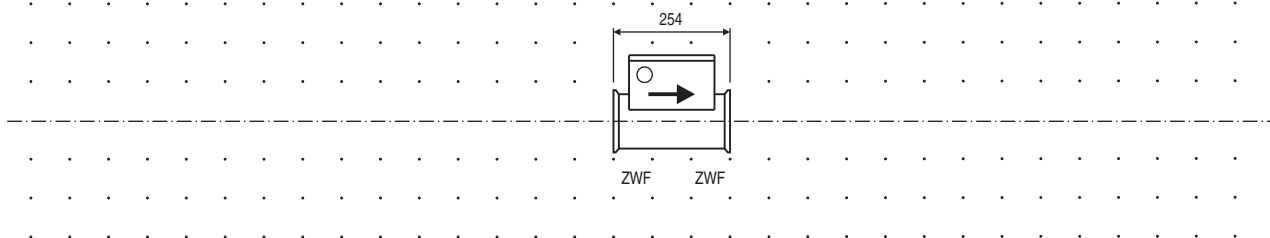


Dimensions X and Y depend on customer requirement

**Standard measuring sections**



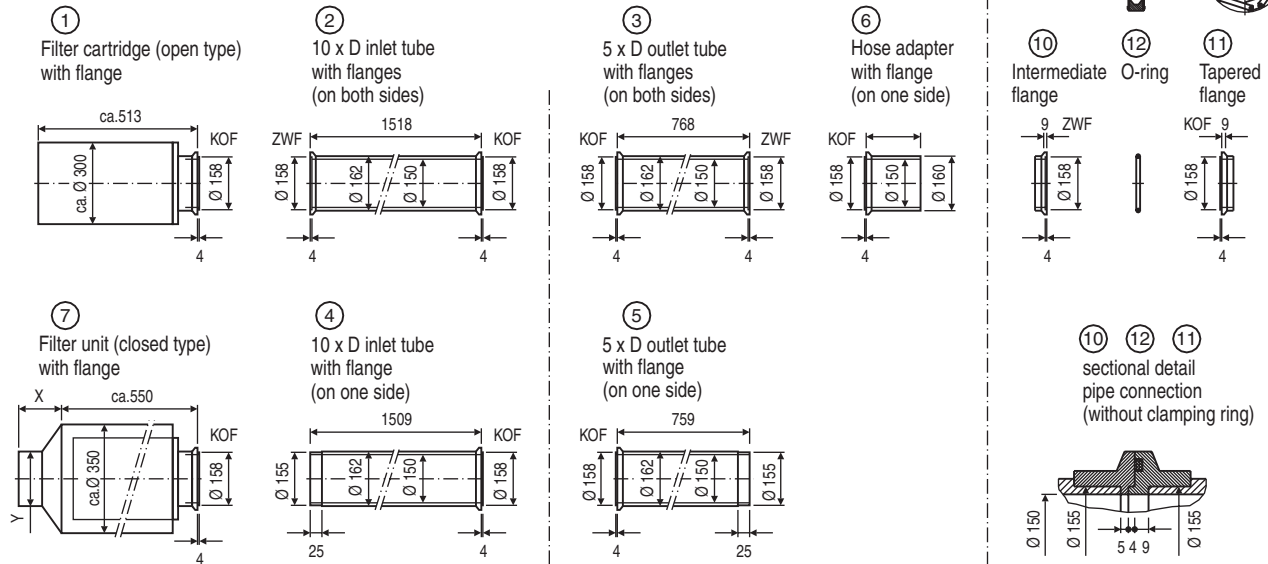
**Individual planning**



**Dimensional drawing** (dimensions in mm)

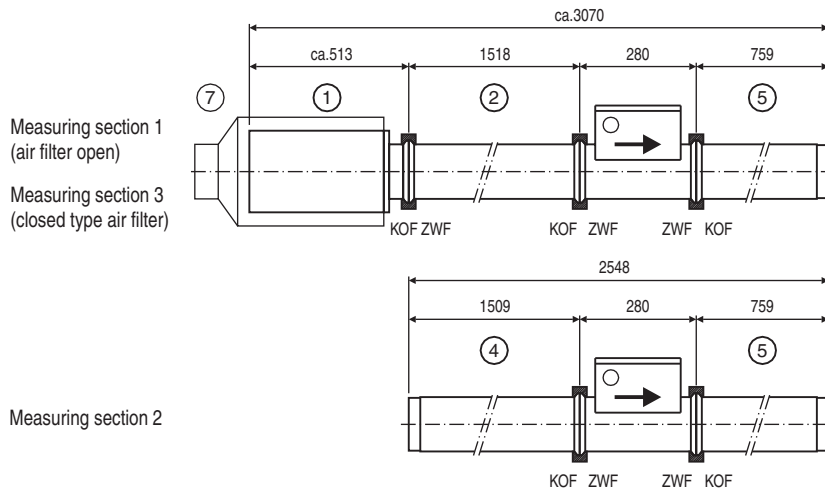
**Modules NW 150**

KOF = Tapered flange (with recessed face and groove for O-ring)  
ZWF = Intermediate flange (with raised face)

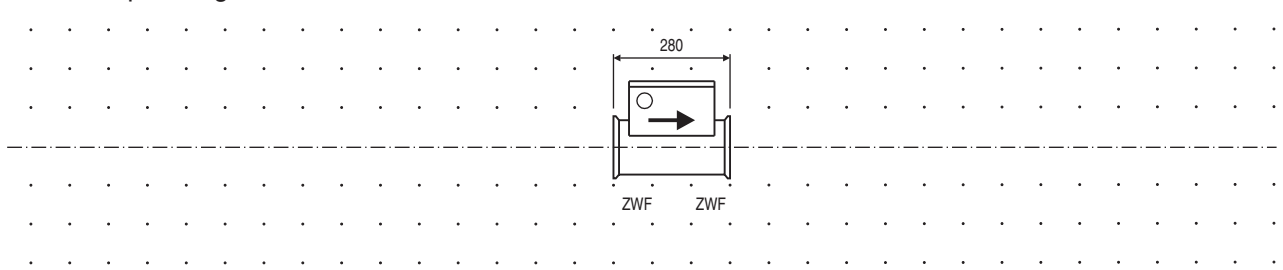


Dimensions X and Y depend on customer requirement

**Standard measuring sections**



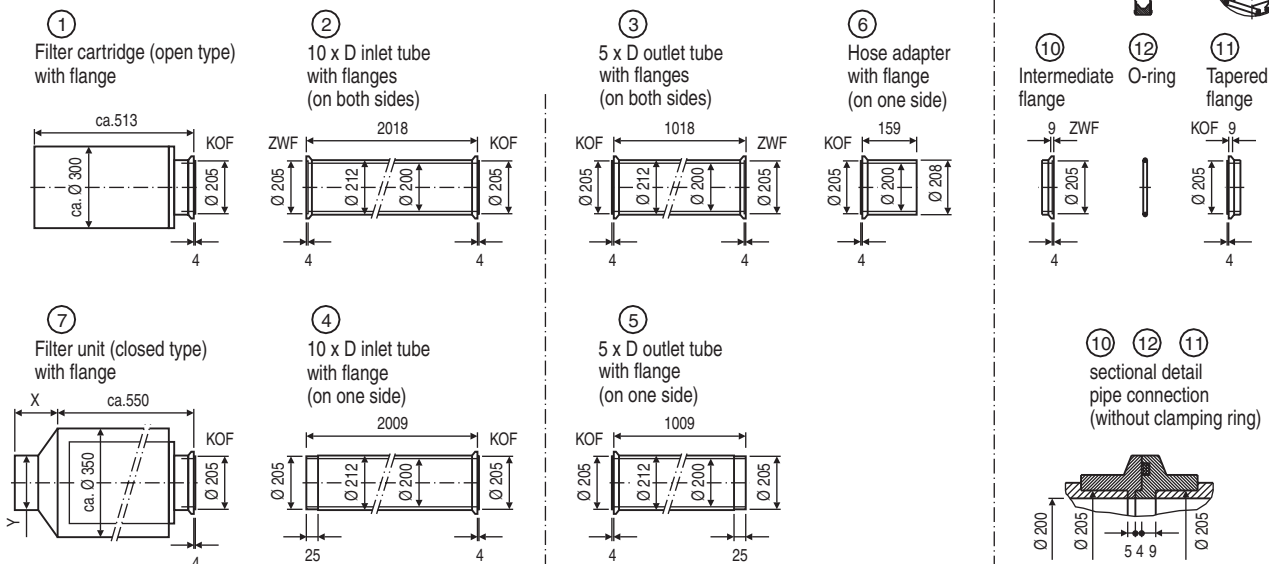
**Individual planning**



**Dimensional drawing** (dimensions in mm)

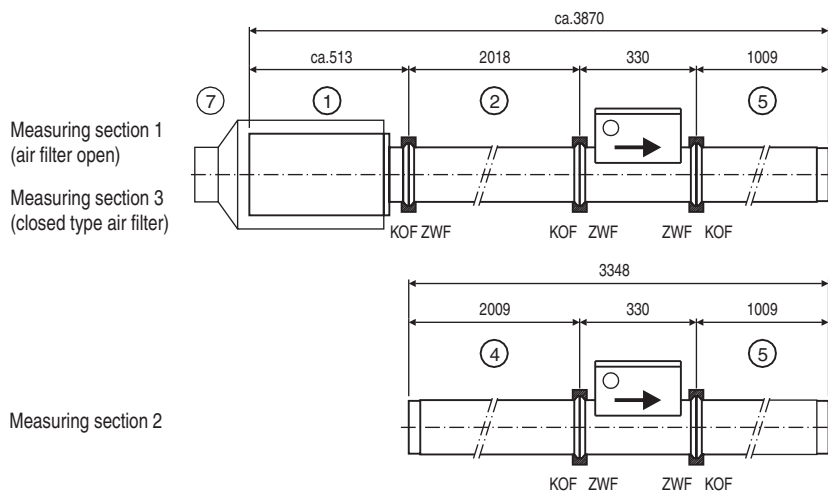
**Modules NW 200**

KOF = Tapered flange (with recessed face and groove for O-ring)  
ZWF = Intermediate flange (with raised face)

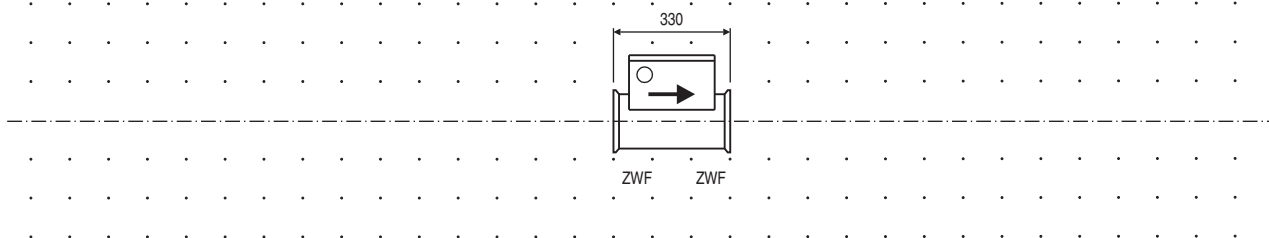


Dimensions X and Y depend on customer requirement

**Standard measuring sections**



**Individual planning**



Ordering information				
	Catalog No	Code		
<b>Transducer Sensyflow P</b>				
Comprising of: Sensor unit (built -in), transmitter circuit in terminal box including calibration				
<b>Transducer, standard characteristic curve and calibration certificate</b>				
Measuring-point parameters: Type of gas: air Operating temperature: -25...80 °C, Pressure (absolute): 1...2.5 bar				
Measuring pipe	Measuring range	Weight (kg)		
NW 25	0 ( 1)... 60 kg/h	1.100	14241-7962633	
NW 50	0 ( 10)... 400 kg/h	2.000	14241-7962634	
NW 80	0 ( 20)... 720 kg/h	2.300	14241-7962635	
NW 100	0 ( 40)...1200 kg/h	3.100	14241-7962636	
NW 150	0 ( 80)...2400 kg/h	4.300	14241-7962637	
NW 200	0 (200)...4000 kg/h	7.900	14241-7962638	
<b>Transducer, special characteristic<sup>1)</sup> curve and calibration certificate</b>				
Measuring-point parameters: Type of gas: air				
Measuring pipe		Weight (kg)		
NW 25		1.100	14241-7962639	
NW 50		2.000	14241-7962640	
NW 80		2.300	14241-7962641	
NW 100		3.100	14241-7962642	
NW 150		4.300	14241-7962643	
NW 200		7.900	14241-7962644	
Additional ordering information				
<b>Definition of special characteristic</b>				
Operating temperature (please specify with clear text)			512	
Operating pressure (please specify with clear text)			513	
Measuring range (please specify with clear text)			514	
Unit (please specify with clear text)			515	
Standard state (please specify with clear text) <sup>2)</sup>			516	
<b>DKD certificate</b>				
In house calibration with air.			310	
DKD = Deutscher Kalibrierdienst (German Calibration Service), supervised by PTB (Physical and Technical Federal Institute)				
Ordering information for equipment packages <sup>3)</sup>				
<b>Supply/evaluation unit for 1 transducer</b>				
19" Plug -in version	Weight 7.0 kg	V14243-1111010	411	
Display 6 digit, display unit kg/h Power supply 230 V AC Measuring rate adjustable Serial interface V24/RS 232C, analog output 0...10 V Temperature display				
1/2 19" Desktop housing	Weight 7.3 kg	V14243-1211010	411	
Display 6 digit, display unit kg/h Power supply 230 V AC Measuring rate adjustable Serial interface V24/RS 232C, analog output 0...10 V Temperature display				

<sup>1)</sup> Definition of the special characteristic curve, see additional ordering information

<sup>2)</sup> e. g. Nm<sup>3</sup>/h related to standard conditions 0 °C, 1013 mbar (hPa)

<sup>3)</sup> 10 % discount in relation to individual combination

# Sensyflow P – Thermal air-mass flowmeter for test rigs and quality assurance

10/14-6.84 EN

Ordering information									
					Catalog No.			Code	
<b>Supply/evaluation unit Sensyflow P</b>					<b>V14243</b>			0	
<b>Supply/evaluation unit</b> Display 6 digit, display unit kg/h, measuring rate adjustable for 1 transducer for 2 transducers					1	2			
<b>Design weight (kg)</b>									
19" Plug-in card					7.0	1			
1/2 19" Desk-top housing					7.3	2			
19" Desk-top housing					7.4	3			
2nd Display unit see Code Nos 401-409									
Temperature display see Code Nos 411, 412									
<b>Power supply</b>									
230 V AC					1				
110 V AC					2				
<b>Digital interface</b>									
without					0				
V24/RS 232 C, serial					1				
ASAM-GDI and V24/RS 232 C, serial					2				
<b>Totalizer</b>									
without					0				
Totalizer, only in combination with V24/RS 232C interface					1				
<b>Output signal</b>									
0...10 V					1				
0...10 V and 0...20 mA					4				
0...10 V and 4...20 mA					5				
Additional ordering information									
<b>Details only with subsequent or individual order for special characteristic curves or standard volume unit</b>									
Measuring-point parameter, type of gas air									
Operating temperature (please specify in clear text)									
Operating pressure (please specify in clear text)									
Measuring range (please specify in clear text)									
Unit (please specify in clear text)									
Standard state (please specify in clear text)									
<b>2nd display unit, switchable to:</b>									
g/s									
Nm <sup>3</sup> /h (at 0 °C and 1013 hPa)									
Nm <sup>3</sup> /h (at 20 °C and 1013 hPa)									
Nl/s (at 0 °C and 1013 hPa)									
Nl/s (at 20 °C and 1013 hPa)									
Nl/min (at 0 °C and 1013 hPa)									
Switchable to (please note Code-No 516), please specify with clear text									
<b>Temperature display</b>									
for 1 transducer									
for 2 transducers									
<b>Accessories</b>									
					Catalog No.				
<b>Supply/evaluation unit, later implementation</b> of ASAM-GDI including certification (only in combination with serial interface)					14247-7962840				

<b>Ordering information accessories</b>			
			Catalog No.
<b>Measuring section 1</b> , comprising of: Air filter (open), inlet tube 10 x D, 1 tapered flange, 1 intermediate flange, outlet tube 5 x D, 1 tapered flange, 3 clamping rings/chains			
Nominal size	Weight (kg)		
NW 25	1.500		14247-7962645
NW 50	4.100		14247-7962646
NW 80	8.250		14247-7962647
NW 100	12.600		14247-7962648
NW 150	20.000		14247-7962649
NW 200	25.600		14247-7962650
<b>Measuring section 2</b> , comprising of: Inlet tube 10 x D, 1 tapered flange, outlet tube 5 x D, 1 tapered flange, 2 clamping rings/chains			
Nominal size	Weight (kg)		
NW 25	0.530		14247-7962651
NW 50	2.030		14247-7962652
NW 80	5.100		14247-7962653
NW 100	7.600		14247-7962654
NW 150	12.000		14247-7962655
NW 200	16.800		14247-7962656
<b>Measuring section 3</b> , comprising of: Air filter (closed type), inlet tube 10 x D, 1 tapered flange, 1 intermediate flange, outlet tube 5 x D, 1 tapered flange, 3 clamping rings/chains, hose socket on suction side			
Nominal size	suction side	Weight (kg)	
NW 50	NW 80	9,600	14247-7964108
NW 80	NW 100	13,900	14247-7964109
NW 100	NW 150	21,200	14247-7964110
NW 150	NW 200	32,000	14247-7964111
NW 200	NW 250	39,000	14247-7964112
<b>Air filter (open)</b> , Filter coupling flange, 1 clamping ring/chain			
Nominal size	Weight (kg)		
NW 25	0.900		14247-7962657
NW 50	1.980		14247-7962658
NW 80	3.100		14247-7962659
NW 100	4.930		14247-7962660
NW 150	7.500		14247-7962661
NW 200	8.100		14247-7962662
<b>Air filter (closed type)</b> , Filter coupling flange, 1 clamping ring/chain, hose socket on suction side			
Nominal size	suction side	Weight (kg)	
NW 50	NW 80	7,500	14247-7964102
NW 80	NW 100	8,700	14247-7964103
NW 100	NW 150	13,500	14247-7964104
NW 150	NW 200	19,500	14247-7964105
NW 200	NW 250	21,500	14247-7964106
<b>Inlet tube 10 x D</b> , 1 Tapered flange, 1 intermediate flange, 1 clamping ring/chain			
Nominal size	Weight (kg)		
NW 25	0.350		14247-7962663
NW 50	1.380		14247-7962664
NW 80	3.300		14247-7962665
NW 100	5.000		14247-7962666
NW 150	8.200		14247-7962667
NW 200	11.400		14247-7962668
<b>Inlet tube 10 x D</b> , 1 Tapered flange, 1 clamping ring/chain			
Nominal size	Weight (kg)		
NW 25	0.320		14247-7962669
NW 50	1.300		14247-7962670
NW 80	3.200		14247-7962671
NW 100	4.900		14247-7962672
NW 150	7.900		14247-7962673
NW 200	10.700		14247-7962674

<b>Ordering information accessories</b>				
		Catalog No.		
<b>Outlet tube 5 x D</b> , 1 Tapered flange, 1 intermediate flange, 1 clamping ring/chain				
Nominal size	Weight (kg)			
NW 25	0.320	14247-7962675		
NW 50	0.800	14247-7962676		
NW 80	1.850	14247-7962677		
NW 100	2.800	14247-7962678		
NW 150	4.600	14247-7962679		
NW 200	6.700	14247-7962680		
<b>Outlet tube 5 x D</b> , 1 tapered flange, 1 clamping ring/chain				
Nominal size	Weight (kg)			
NW 25	0.250	14247-7962681		
NW 50	0.750	14247-7962682		
NW 80	1.750	14247-7962683		
NW 100	2.700	14247-7962684		
NW 150	4.300	14247-7962685		
NW 200	6.100	14247-7962686		
<b>Hose adapter</b> 1 tapered flange, 1 clamping ring/chain				
Nominal size	Weight (kg)			
NW 25	0.120	14247-7962687		
NW 50	0.320	14247-7962688		
NW 80	0.500	14247-7962689		
NW 100	0.630	14247-7962690		
NW 150	1.600	14247-7962691		
NW 200	2.000	14247-7962692		
<b>Ordering information individual parts</b>				
<b>Tapered flange</b> (please order O-ring separately)				
Nominal size	Weight (kg)			
NW 25	0,020	14247-7962700		
NW 50	0,067	14247-7962701		
NW 80	0,112	14247-7962702		
NW 100	0,114	14247-7962703		
NW 150	0,353	14247-7962704		
NW 200	0,600	14247-7962705		
<b>O-Ring (DN 25 includes centering rings)</b>				
Nominal size	Weight (kg)			
NW 25	0.012	14247-7962706		
NW 50	0.004	14247-7962707		
NW 80	0.005	14247-7962708		
NW 100	0.006	14247-7962709		
NW 150	0.015	14247-7962710		
NW 200	0.031	14247-7962711		
<b>Intermediate flange</b>				
Nominal size	Weight (kg)			
NW 25	0.020	14247-7962712		
NW 50	0.068	14247-7962713		
NW 80	0.102	14247-7962714		
NW 100	0.111	14247-7962715		
NW 150	0.214	14247-7962716		
NW 200	0.610	14247-7962717		
<b>Clamping ring</b>				
Nominal size	Weight (kg)			
NW 25	0.087	14247-7962718		
NW 50	0.180	14247-7962719		
NW 80	0.180	14247-7962720		
NW 100	0.230	14247-7962721		
<b>Clamping chain</b>				
Nominal size	Weight (kg)			
NW 150	0.590	14247-7962722		
NW 200	0.720	14247-7962723		

Ordering information individual parts				
		Catalog No.		
<b>Complete flange coupling</b> , comprising of: 1 tapered flange, 1 intermediate flange, O-ring and 1 clamping ring/chain				
Nominal size	Weight (kg)			
NW 25	0.137	14247-7962724		
NW 50	0.320	14247-7962725		
NW 80	0.430	14247-7962726		
NW 100	0.480	14247-7962727		
NW 150	1.210	14247-7962728		
NW 200	2.020	14247-7962729		
<b>Filter cartridge</b>				
Nominal size	Weight (kg)			
NW 25	0.630	14247-7962730		
NW 50	1.400	14247-7962731		
NW 80	2.250	14247-7962732		
NW 100	4.000	14247-7962733		
NW 150	5.000	14247-7962734		
NW 200	5.000	14247-7962735		
<b>Filter coupling flange</b>				
Nominal size	Weight (kg)			
NW 25	0.198	14247-7962736		
NW 50	0.420	14247-7962737		
NW 80	0.670	14247-7962738		
NW 100	0.740	14247-7962739		
NW 150	1.900	14247-7962740		
NW 200	2.450	14247-7962741		
<b>Transducer cables</b>				
Length	Weight (kg)			
3 m	0.220	14247-7962693		
8 m	0.490	14247-7962694		
15 m	0.860	14247-7962695		
30 m	2.560	14247-7962696		
<b>Interface cable</b>				
25-pin connector (1 piece), length 3 m, weight 0.220 kg		14247-7962697		

**Technical support and application:**  
**E-Mail: [sensyflow.deapr@de.abb.com](mailto:sensyflow.deapr@de.abb.com)**



[www.abb.com](http://www.abb.com)

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**ABB Ltd**  
Oldends Lane, Stonehouse  
Gloucestershire, GL10 3TA  
UK  
Phone +44(0)1453-826-661  
Fax +44(0)1453-827-856

**ABB Inc.**  
125 E. County Line Road  
Warminster, PA 18974  
USA  
Phone +1 215-674-6000  
Fax +1 215-674-7183

**ABB Inc.**  
3450 Harvester Road  
Burlington Ontario L7N 3W5  
Canada  
Phone +1 905 681 0565  
Fax +1 905 681 2810

**ABB Automation Products GmbH**  
Borsigstrasse 2  
D-63755 Alzenau  
Germany  
Phone +49(0)60 23 92 - 33 13  
Fax +49(0)60 23 92 - 32 10